

WE CLAIM:

1. A barrier sheet comprising:
  - (A) a first outer layer of breathable material,
  - (B) a second outer layer of breathable material, at least one of said first and second outer layers defining liquid-permeable pores therethrough, and
  - (C) a layer of material disposed intermediate said first and second outer layers, said intermediate layer being three dimensionally expandable upon exposure to a liquid insult to form a layer of material blocking said pores of at least one of said first and second outer layers and increasing the liquid transmission resistance of said sheet in the direction of and at the point of liquid insult;

said first and second outer layer being secured together with said intermediate layer therebetween;

said sheet prior to exposure to liquid being characterized by a permeability of at least one of an MVTR of at least 500 gsm/24 hrs and an air permeability of at least 10 scfm/square foot; and

said intermediate layer prior to exposure to liquid having a basis weight no greater than one of 15 gsm and 10% of the basis weight of said sheet prior to exposure to liquid.
2. The barrier sheet of Claim 1 having a hydrohead of at least 10 millibars in one direction.
3. The barrier sheet of Claim 1 having a hydrohead which is at least 25% greater than the hydrohead of a barrier sheet consisting of said first and second outer layers secured together without said intermediate layer.
4. The barrier sheet of Claim 1 wherein said intermediate layer has a basis weight no greater than 10 gsm.
5. The barrier sheet of Claim 4 wherein said intermediate layer has a basis weight no greater than 5 gsm.

6. The barrier sheet of Claim 5 wherein said intermediate layer has a basis weight no greater than 3 gsm.

7. The barrier sheet of Claim 6 wherein said intermediate layer has a basis weight no greater than 2 gsm.

5 8. The barrier sheet of Claim 1 wherein a distal outer layer is the last of said outer layers to be exposed to liquid and defines liquid-permeable pores therethrough, and, after exposure to liquid in a given area thereof, a substantial proportion of said pores of said distal outer layer in the given area are infiltrated and blocked against liquid passage therethrough by portions of said intermediate layer.

10 9. The barrier sheet of Claim 8 wherein said distal outer layer is in immediate physical contact with said intermediate layer.

15 10. The barrier sheet of Claim 9 wherein essentially the entire adjacent surfaces of said distal outer layer and said intermediate layer are in immediate physical contact.

11. The barrier sheet of Claim 1 wherein said outer layers are independently selected from the group consisting of wovens, nonwovens, microporous films, and combinations thereof.

12. The barrier sheet of Claim 11 wherein at least one of said outer layers is a meltblown nonwoven.

13. The barrier sheet of Claim 12 wherein both of said outer layers are meltblown nonwovens.

14. The barrier sheet of Claim 1 wherein said intermediate layer is discontinuous.

25 15. The barrier sheet of Claim 14 wherein said intermediate layer is formed of particles.

16. The barrier sheet of Claim 14 wherein said intermediate layer is formed of fibers.

17. The barrier sheet of Claim 1 wherein said intermediate layer is a material capable of expanding in volume by a factor of at least 2 upon exposure to sufficient liquid.

5 18. The barrier sheet of Claim 17 wherein said intermediate layer is formed of super-absorbent polymer.

19. The barrier sheet of Claim 1 wherein said intermediate layer is a thin layer of solid material which is essentially instantaneously expandable upon exposure to liquid.

10 20. The barrier sheet of Claim 1 wherein said intermediate layer is expandable to form a gel-like layer upon exposure to liquid.

21. The barrier sheet of Claim 1 wherein said intermediate layer has a basis weight no greater than 5% of the basis weight of said sheet prior to exposure to liquid.

15 22. The barrier sheet of Claim 21 wherein said intermediate layer has a basis weight no greater than 4% of the basis weight of said sheet prior to exposure to liquid.

23. The barrier sheet of Claim 22 wherein said intermediate layer has a basis weight no greater than 2% of the basis weight of said sheet prior to exposure to liquid.

20 24. The barrier sheet of Claim 23 wherein said intermediate layer has a basis weight no greater than 1% of the basis weight of said sheet prior to exposure to liquid.

25. The barrier sheet of Claim 1 wherein said sheet is flexible.

26. The barrier sheet of Claim 1 wherein said outer layers are secured together by an elastic adhesive.

27. The barrier sheet of Claim 26 wherein said elastic adhesive is in the form of a discontinuous layer.

28. The barrier sheet of Claim 1 wherein said outer layers are secured together by fusion bonding.

29. The barrier sheet of Claim 1 wherein said intermediate layer is formed of a liquid-expandable material selected from the group consisting of starch, gelatin, viscose, pulp, cotton, water-insoluble polymers, and combinations thereof.

5 30. The barrier sheet of Claim 1 wherein said sheet prior to exposure to liquid is characterized by a permeability of at least one of an MVTR of about 500-5,000 gsm/24 hrs and an air permeability of about 10-1,000 scfm/square foot.

10 31. The barrier sheet of Claim 1 wherein said formed layer is an essentially continuous, film-like, substantially liquid-impermeable layer.

32. The barrier sheet of Claim 1 wherein said formed layer is discontinuous.

15 33. A disposable garment including the barrier sheet of  
Claim 1.

34. A barrier sheet consisting of:

(A) a first layer of breathable material defining liquid-permeable pores therethrough, and

(B) a second layer of material disposed on and secured to said first layer, said second layer being three dimensionally expandable upon exposure to a liquid insult to form a layer of material blocking said pores of said first layer and increasing the liquid transmission resistance of said sheet in the direction of and at the point of liquid insult;

20 said sheet prior to exposure to liquid being characterized by a permeability of at least one of an MVTR of at least 500 gsm/24 hrs and an air permeability of at least 10 scfm/square foot; and

25 said second layer prior to exposure to liquid having a basis weight no greater than one of 15 gsm or 10% of the basis weight of said sheet prior to exposure to liquid.

30 35. The barrier sheet of Claim 34 having a hydrohead of at least 10 millibars in one direction.

36. The barrier sheet of Claim 34 having a hydrohead which is at least 25% greater than the hydrohead of said first layer without said second layer.

5 37. The barrier sheet of Claim 34 wherein said second layer has a basis weight no greater than 10 gsm.

38. The barrier sheet of Claim 37 wherein said second layer has a basis weight no greater than 5 gsm.

10 39. The barrier sheet of Claim 34 wherein said first layer is the last of said layers to be exposed to liquid, and, after exposure to liquid in a given area thereof, a substantial proportion of said pores of said first layer in the given area are infiltrated and blocked against liquid passage therethrough by portions of said second layer.

15 40. The barrier sheet of Claim 39 wherein said first layer is in immediate physical contact with said second layer.

15 41. The barrier sheet of Claim 40 wherein essentially the entire adjacent surfaces of said distal outer layer and said intermediate layer are in immediate physical contact.

20 42. The barrier sheet of Claim 34 wherein said first layer is selected from the group consisting of wovens, nonwovens, microporous films, and combinations thereof.

43. The barrier sheet of Claim 42 wherein said first layer is a meltblown nonwoven.

44. The barrier sheet of Claim 42 wherein said first layer is a spunbond nonwoven.

25 45. The barrier sheet of Claim 34 wherein said second layer is discontinuous.

46. The barrier sheet of Claim 45 wherein said second layer is formed of particles.

30 47. The barrier sheet of Claim 45 wherein said second layer is formed of fibers.

48. The barrier sheet of Claim 34 wherein said second layer is a material capable of expanding in volume by a factor of at least 2 upon exposure to sufficient liquid.

5 49. The barrier sheet of Claim 48 wherein said second layer is formed of super-absorbent polymer.

50. The barrier sheet of Claim 34 wherein said second layer is a thin layer of solid material which is essentially instantaneously expandable upon exposure to liquid.

10 51. The barrier sheet of Claim 34 wherein said second layer is expandable to form a gel-like layer upon exposure to liquid.

52. The barrier sheet of Claim 34 wherein said second layer has a basis weight no greater than 5% of the basis weight of said sheet prior to exposure to liquid.

15 53. The barrier sheet of Claim 52 wherein said second layer has a basis weight no greater than 4% of the basis weight of said sheet prior to exposure to liquid.

54. The barrier sheet of Claim 53 wherein said second layer has a basis weight no greater than 2% of the basis weight of said sheet prior to exposure to liquid.

20 55. The barrier sheet of Claim 54 wherein said second layer has a basis weight no greater than 1% of the basis weight of said sheet prior to exposure to liquid.

56. The barrier sheet of Claim 34 wherein said sheet is flexible.

25 57. The barrier sheet of Claim 34 wherein said first and second layers are secured together by an elastic adhesive.

58. The barrier sheet of Claim 57 wherein said elastic adhesive is in the form of a discontinuous layer.

59. The barrier sheet of Claim 57 wherein said first and second layers are secured together by fusion bonding.

60. The barrier sheet of Claim 34 wherein said second layer is a liquid-expandable material selected from the group consisting of starch, gelatin, viscose, pulp, cotton, water-insoluble polymers, and combinations thereof.

5 61. The barrier sheet of Claim 34 wherein said sheet prior to exposure to liquid is characterized by a permeability of at least one of an MVTR of about 500-5,000 gsm/24 hrs and an air permeability of about 10-1,000 scfm/square foot.

10 62. The barrier sheet of Claim 34 wherein said second layer has a basis weight no greater than 3 gsm.

63. The barrier sheet of Claim 34 wherein said second layer has a basis weight no greater than 2 gsm.

64. The barrier sheet of Claim 34 wherein said formed layer is an essentially continuous, film-like, substantially liquid-impermeable layer.

15 65. The barrier sheet of Claim 34 wherein said formed layer is discontinuous.

66. A disposable garment including the barrier sheet of Claim 31.

20 67. A disposable garment including a barrier sheet comprising:  
(A) a first material which is breathable and defines liquid-permeable pores therethrough, and

25 (B) a second material, said second material being three dimensionally expandable upon exposure to a liquid insult to form a layer of material blocking said pores of said first layer and increasing the liquid transmission resistance of said sheet in the direction of and at the point of liquid insult;

said second material being disposed in said first material; said sheet prior to exposure to liquid being characterized by a permeability of at least one of an MVTR of at least 500 gsm/24hrs and an air permeability of at least 10 scfm/square foot; and

*Sabat* | said second material prior to exposure to liquid having a weight no greater than one of 15 gsm and 10% of the basis weight of said sheet prior to exposure to liquid.

5        68. The disposable garment of Claim 67 wherein said sheet has a hydrohead of at least 10 millibars in one direction.

10      69. The disposable garment of Claim 67 wherein said sheet has a hydrohead which is at least 25% greater than the hydrohead of said first material only.

15      70. The disposable garment of Claim 67 wherein said second material has a basis weight no greater than 10 gsm.

20      71. The disposable garment of Claim 70 wherein said second material has a basis weight no greater than 5 gsm.

25      72. The disposable garment of Claim 67 wherein said second material is at least partially disposed adjacent the surface of said first material to be initially exposed to liquid and relatively remote from the opposite surface of said first material, and, after exposure to liquid in a given area, a substantial proportion of such pores of said first material in the given area are infiltrated and blocked against liquid passage therethrough by portions of said second material.

30      73. The disposable garment of Claim 72 wherein said first and second materials are in immediate physical contact.

25      74. The disposable garment of Claim 67 wherein said first material is selected from the group consisting of wovens, nonwovens, microporous films, and combinations thereof.

30      75. The disposable garment of Claim 74 wherein said first material is a meltblown nonwoven.

25      76. The disposable garment of Claim 74 wherein said first material is a spunbond nonwoven.

30      77. The disposable garment of Claim 67 wherein said second material is discontinuous.

78. The disposable garment of Claim 77 wherein said second material is formed of particles.

79. The disposable garment of Claim 77 wherein said second material is formed of fibers.

5 80. The disposable garment of Claim 67 wherein said second material is a material capable of expanding in volume by a factor of at least 2 upon exposure to sufficient liquid.

10 81. The disposable garment of Claim 80 wherein said second material is formed of super-absorbent polymer.

15 82. The disposable garment of Claim 67 wherein said second material is a thin layer of solid material which is essentially instantaneously expandable upon exposure to liquid.

83. The disposable garment of Claim 67 wherein said second material is expandable to form a gel-like layer upon exposure to liquid.

15 84. The disposable garment of Claim 67 wherein said second material has a weight no greater than 5% of the weight of said sheet prior to exposure to liquid.

20 85. The disposable garment of Claim 84 wherein said second material has a weight no greater than 4% of the weight of said sheet prior to exposure to liquid.

86. The disposable garment of Claim 85 wherein said second material has a weight no greater than 2% of the weight of said sheet prior to exposure to liquid.

25 87. The disposable garment of Claim 86 wherein said second material has a weight no greater than 1% of the weight of said sheet prior to exposure to liquid.

88. The of Claim 67 wherein said sheet is flexible.

89. The disposable garment of Claim 67 wherein said second material is dispersed within and physically entrapped by said first material.

90. The disposable garment of Claim 67 wherein said second material is selected from the group consisting of starch, gelatin, viscose, pulp, cotton, water-insoluble polymers, and combinations thereof.

5 91. The disposable garment of Claim 67 wherein said sheet prior to exposure to liquid is characterized by a permeability of at least one of an MVTR of about 500-5,000 gsm/24 hrs and an air permeability of about 10-1,000 scfm/square foot.

10 92. The disposable garment of Claim 67 wherein said second material has a basis weight no greater than 3 gsm.

93. The disposable garment of Claim 92 wherein said second material has a basis weight no greater than 2 gsm.

15 94. The disposable garment of Claim 67 wherein said formed layer is an essentially continuous, film-like, substantially liquid-impermeable layer.

95. The disposable garment of Claim 67 wherein said formed layer is discontinuous.

20 96. A barrier sheet characterized by a variable level of breathability, the breathability of the barrier sheet substantially decreasing in a given area upon a liquid insult to the barrier sheet in the given area.

97. The barrier sheet of Claim 96 wherein the breathability of the barrier sheet is determined by the MVTR thereof.

98. The barrier sheet of Claim 96 wherein the breathability of the barrier sheet is determined by the air permeability thereof.

25 99. The barrier sheet of Claim 96 wherein the barrier sheet prior to exposure to liquid is characterized by a permeability of at least one of an MVTR of at least 500 gsm/24 hours and an air permeability of at least 10 scfm/square foot, and upon exposure to liquid is characterized by a permeability of at least one of an MVTR of no more than 1,000 gsm/24 hours and an air permeability of no more than 10 scfm/square foot.

100. The barrier sheet of Claim 96 having a hydrohead of at least 10 millibars in one direction.

101. The barrier sheet of Claim 96 comprising:

(A) a first outer layer of breathable material,

5 (B) a second outer layer of breathable material, at least one of said first and second outer layers defining liquid-permeable pores therethrough, and

10 (C) a layer of material disposed intermediate said first and second outer layers, said intermediate layer being three dimensionally expandable upon exposure to a liquid insult to form a layer of material blocking said pores of at least one of said first and second outer layers and increasing the liquid transmission resistance of said sheet in the direction of and at the point of liquid insult;

15 said first and second outer layer being secured together with said intermediate layer therebetween;

said sheet prior to exposure to liquid being characterized by a permeability of at least one of an MVTR of at least 500 gsm/24 hrs and an air permeability of at least 10 scfm/square foot; and

20 said intermediate layer prior to exposure to liquid having a basis weight no greater than one of 15 gsm and 10% of the basis weight of said sheet prior to exposure to liquid.

102. The barrier sheet of Claim 101 wherein said intermediate layer clogs said pores of said at least one outer layer upon exposure to liquid.

25 103. A disposable garment including the barrier sheet of Claim 101.

104. The barrier sheet of Claim 96 consisting of:

(A) a first layer of breathable material defining liquid-permeable pores therethrough, and

30 (B) a second layer of material disposed on and secured to said first layer, said second layer being three dimensionally expandable upon

exposure to a liquid insult to form a layer of material blocking said pores of said first layer and increasing the liquid transmission resistance of said sheet in the direction of and at the point of liquid insult;

said sheet prior to exposure to liquid being characterized by a permeability of at least one of an MVTR of at least 500 gsm/24 hrs and an air permeability of at least 10 scfm/square foot; and

said second layer prior to exposure to liquid having a basis weight no greater than one of 15 gsm and 10% of the basis weight of said sheet prior to exposure to liquid.

10 105. The barrier sheet of Claim 104 wherein said second layer clogs said pores upon exposure to liquid.

106. A disposable garment including the barrier sheet of  
Claim 105.

15 107. A disposable garment including a barrier sheet comprising:  
(A) a first material which is breathable and defines liquid-permeable pores therethrough, and  
(B) a second material, said second material being three dimensionally expandable upon exposure to a liquid insult to form a layer of material blocking said pores of said first layer and increasing the liquid transmission resistance of said sheet in the direction of and at the point of liquid insult;

20 said second material being disposed in said first material;  
said sheet prior to exposure to liquid being characterized by a permeability of at least one of an MVTR of at least 500 gsm/24hrs and an air permeability of at least 10 scfm/square foot; and

25 said second material prior to exposure to liquid having a weight no greater than one of 15 gsm and 10% of the basis weight of said sheet prior to exposure to liquid.

30 108. The disposable garment of Claim 107 wherein said second material clogs said pores upon exposure to liquid.